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plants growing under the immediate influence of the acid fumes and others growing under similar conditions but not within the smoke zone, must be made.—H. HASSELBRING.

Viticulture.—Recent publications from the Royal Hungarian Central Institute of Viticulture are as follows: Volume III, part 2, consists of chemical analyses of the stems and shoots of American species used for stocks in Hungary.¹⁴ The points determined were the moisture content, ether extractives (oils, fats, waxes, gums, and organic acids not further determined), alcoholic extractives (tannin, glucotannin, vanillin, and organic acids), nitrogen, starch, cellulose, and proteids. The paper contains a large number of analyses made at different seasons, but no general results have yet been reached, and it is difficult to see what may be expected. Part 3 of this volume is a small paper by ISTVÁNNFI¹⁵ in which he describes a disease of the vine caused by *Phyllosticta Bizzozzeriana* Massal. The disease is not of great importance, but has been mistaken for the black rot, one of the most dangerous vine diseases. In the part 4 ISTVÁNNFI¹⁶ gives the results of his investigations on the gray rot, caused by *Botrytis cinerea*. The first part of this paper is taken up with the effects of various kinds of poisons and other treatments as cold, drying, etc., on the spores of the fungus. One of the most striking results is the unusually high resistance which the spores are said to have to copper. Spores were kept twenty-four hours in different strengths of Bordeaux mixture ranging from 1 to 10 per cent., to which was then added must containing 1 per cent. of tartaric acid, so that the resulting solutions contained the equivalent of 0.3 per cent. CuSO_4 . Of the spores from the lowest strength mixture 38–40 per cent. germinated, of those in the highest 10–12 per cent. germinated. Spores sown on berries in 3 per cent. Bordeaux mixture germinated and penetrated the epidermis. Spores, kept one hour in a 2 per cent. solution of CuSO_4 , which was then diluted with ten times its volume of must, germinated. Many other similar experiments are given. The second part of the paper deals with the development and life history of *Botrytis cinerea* and methods of control. Very little new is added to the life history of the fungus. For treatment, spraying with a 5 per cent. solution of calcium bisulfid is recommended.—H. HASSELBRING.

Endotrophic mycorrhiza.—The long and important paper of GALLAUD¹⁷ on this subject merits brief summary, as his conclusions are quite revolutionary. He has described for the first time the anatomical and cytological characters of

¹⁴ GASPAR, J., Analyses des sarments américains. Ann. Inst. Cent. Ampél. Roy. Hongrois 3:57–166. pls. 4–12. 1905.

¹⁵ ISTVÁNNFI, Gy. de, D'une maladie de la vigne causée par le *Phyllosticta Bizzozzeriana*. Idem, 167–182. pl. 13. 1905.

¹⁶ ISTVÁNNFI, Gy. de, Études microbiologiques et mycologiques sur le rot gris de la vigne. Idem, 183–360. pls. 14–21. 1905.

¹⁷ GALLAUD, I., Études sur les mycorrhizes endotrophes. Rev. Gén. Bot. 17: pls. 4. 1905.

a large number of endophytes, and his study enables him to distinguish four types: (1) type of *Arum maculatum*, hyphae intercellular after traversing the outer cells, their growth arrested by formation of simple terminal haustoria which penetrate the cortical cells; (2) type of *Paris quadrifolia*, hyphae intracellular, of indefinite growth, with complex lateral haustoria arising at definite points; (3) type of Hepaticae, hyphae intracellular, of indefinite growth, entering *via* rhizoids and bearing haustoria transformed into sporangioles; (4) type of Orchideae, hyphae intracellular, of indefinite growth, forming tight pellets which are sometimes permanent and sometimes undergo more or less complete digestion.

There is a remarkable uniformity in the constitution of the cell walls and in the cytological structure. Repeated attempts to isolate the fungi by direct extraction and by inoculation were unsuccessful. The first method failed, probably because the fungus already in was already too much altered by the digestive action of the host, and the second leads the author to distrust utterly the identifications of previous authors. The endophytes, he holds, are *saprophytes internes*, which by their highly differentiated haustoria borrow some non-living nutritive material from the cells in which they live. These cells react very rapidly on the fungus, killing its haustoria, digesting and absorbing them in part; then they resume their normal life, momentarily disturbed. It cannot be said that there is a harmonious symbiosis between the two plants, but rather a conflict between the invading, but little harmful, fungus and the cells which defend themselves by their digestive power.—C. R. B.

Sexual reproduction of *Stigeoclonium*.—PASCHER in an account of the sexual reproduction of *Stigeoclonium fasciculatum*,¹⁸ touches briefly on the formation and behavior of the zoospores (macrospores), which in general agrees with that of other forms, but in a few cases the sporelings developed into filaments of a few cells only, which then formed in each cell a single four-ciliate zoospore (macrospore) that developed like other zoospores. The microspores are four-ciliate and long motile; after losing their motility they become spherical and either form resting-cells, or (rarely) conjugate and form zygotes. The development of the latter was not followed, but from hasty observation he concludes that their germination does not depart from that of the zoospores or the resting-cells. After an indefinite period the resting-cells germinate like the zoospores. Some, however, (akinetes or palmella stage), grow into a few-celled filament, each cell giving rise to four biciliate zoospores, resembling the microspores in size and activity, except that they will not conjugate but germinate at once like the zoospores.

Phylogenetically he claims for *Stigeoclonium fasciculatum* a position midway between *Ulothrix* and *Draparnaldia*, the three kinds of spores indicating that it is on the border-line of sexual reproduction. The same position was long ago claimed by DODEL-PORT for *Ulothrix zonata*. But such generalizations will bear

¹⁸ PASCHER, A., Zur Kenntnis der geschlechtlichen Fortpflanzung bei *Stigeoclonium*. *Flora* 95: 95-107. figs. 2. 1905.